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ABSTRACT

This monograph describes the Transition to Work Simulator (TWS) so that the National Institute of Education can evaluate its capability in helping recommend policy suggestions to the United States Congress on the future of vocational education in America. (The TWS is a pre-implementation laboratory for testing economic and lifestyle impacts of policy recommendations for human resource development and employment programs. Its chief purpose is to help policy persons understand the functioning of the complex human resource development and utilization process so that policy recommendations can predict outcomes with more certainty.) The monograph is separated into four descriptive sections and focused to facilitate a broad-based, policy-value review. Section 2 describes the human resource development and employment program reference system modeled by TWS. Some specific policy issues TWS might address are discussed in section 3: scaling vocational education programs for specific target groups, coordinating planning, occupational information systems and planning with TWS, and federal funding levels and enrollment changes. Section 4 outlines how TWS works, while section 5 examines national data available within TWS parameters. Appendixes include example output tables and a flow chart of decision tables from the Wisconsin application of TWS. (YLB)

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A Monograph

A DESCRIPTION OF A SIMULATION MODEL TO PLAN VOCATIONAL EDUCATION, TRAINING AND EMPLOYMENT PROGRAMS IN THE UNITED STATES

by

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Acknowledgements always seem to sound patronizing, even if they are not intended to be. I am sure this one is no exception.

I acknowledge my sincere gratitude to Henry David, Director of the Vocational Education Study for supporting the Monograph. I hope my work is useful to the Vocational Education Study. Stu Rosenfeld, NIE Senior Associate, served as project officer for the Monograph. His clear thinking helped provide Monograph focus. The Monograph seems to me to be a clear statement of the intention of the Vocational Education Study to provide comprehensive advice to the U.S. Congress about the future of vocational education in the United States.

Needless to say, the views expressed within the Monograph are those of the author. No constraints were even suggested during the development of the Monograph.

Others from NIE who offered constructive criticism to an early draft of the Monograph included: Richard E. Carlson, Louise P. Corman, David Goodwin, Robert Harris, Gerry Hendrichson, and Rodney Riffel. Patricia Brenner, an economist working with the National Commission for Employment Policy, provided helpful criticism, so did Dave Law, a labor economist with the Department of Labor. Ray Parrott, Executive Director of the National Advisory Council on Vocational Education, offered suggestions that contributed to Monograph focus. John Nealon of the Bureau of Occupational and Adult Education provided positive advice. The Monograph is a better document because of the constructive criticism offered by all the persons described above.

Unfortunately, I could not respond in detail to all the methodological concerns raised by each person and maintain Monograph focus. Responses to many of the issues raised rest within publications cited in the bibliography.

Finally, I would like to thank Janet Chmielewski for typing, retyping, and retyping the Monograph. That is not an easy task under the best of circumstances.

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1. Introduction

The Transition to Work Simulator is a pre-implementation laboratory for testing economic and lifestyle impacts of policy recommendations for human resource development and employment programs. TWS is a simplifying device. Its chief purpose is to help policy persons understand the functioning of the complex human resource development and utilization process so that policy recommendations can predict outcomes with more certainty.

Computer simulation models in general have become quite widely used in representing the structure of complex systems for policy analysis.(1) A recent GAO evaluation on the use of computer simulation models by HEW in the area of public transfer payments concluded:(2)

> Government policy analysts and decision-makers, in increasing numbers, have been using conceptual models, often implemented on a computer, to perform program and policy analyses. These models enable the analyst/decision-maker to deal with complex issues in such areas as social welfare, food, energy, the environment, transportation and urban planning more effectively than they had done before.
> The GAO recognizes the need for the development of models to support policy and program analyses. Models allow analysts and decision-makers to deal with aspects of these issues which are not readily susceptible to analysis with other tools.

Policy recommendations for human resource development and employment programs are predictions of impact for specific intervention experiences

like vocational education or CETA programs on discrete target groups within the population, e.g.,black, rural females in the Southeast who are between the ages of 18 to 24. Policy recommendations require information about the transitions of target groups of persons through the complex mosaic of education, training and employment programs and into and out of the labor force, under various economic conditions. TWS is a model that represents the complex structure of human resource development and employment programs. TWS includes public transfer programs like general welfare and AFDC, a labor market and a labor force. The simplified model of the more complex "real world" is computerized so that policy persons can simulate quickly policy recommendations and compare the results to current conditions or to outcomes caused by competing policy recommendations.

Simulations provide a way to observe a complex process; there are simply too many variables in the human resource development and utilization process for an observer to take into account.(3) Indeed, the human mind is constrained by size to store and process information,(4) consequently, man makes judgements by means of heuristics. The heuristics appear to be quite simple.(5,6) Computer simulation models are a way of helping persons solve problems and arrive at better estimates of the consequences of a policy recommendation than otherwise possible.

TWS provides a comprehensive environment for planning human resource development and employment programs so that the consequences of policy recommendations can be examined in terms of downstream or longitudinal effects on the labor force and public transfer programs. TWS allows policy persons to concentrate policy attention on target

groups, like unemployed, black teenagers who are high school dropouts of low academic ability and live in large cities in the Northeast. TWS allows policy persons to anticipate the downstream effects of policy for a named target group among human resource development programs. For instance, a policy for vocational education which restricts enrollments to students with a high probability of success in "high-technology" programs, could have a profound future impact on general education and CETA programs, as well as on the labor force and public transfer programs.

The purpose of this Monograph is to describe TWS so that the National Institute of Education can evaluate its capability to help it recommend policy suggestions to the United States Congress on the future of vocational education in the United States. Because vocational education is a part of a larger human resource development and employment program network within the United States, NIE has invited other agencies to participate in the evaluation of TWS as a useful policy tool. These agencies have policy responsibilities for human resource development and employment programs, they include: (1) The Employment and Training Administration; (2) The National Commission for Employment Policy; (3) the Bureau of Occupational and Adult Education and (4) the National Advisory Council for Vocational Education.

Experience has demonstrated that unless simulation models are adapted to address specific policy issues of urgent concern to "in-place" management, they are rarely used in the policy formulation process. Although many government agencies are interested in basic research, most of their attention must be directed to practical, agency mandates.

Consequently, this Monograph includes both a description of TWS and specific policy issues which an operational TWS might address. These policy issues were suggested by NIE and the agencies cited above during a TWS presentation on December 17, 1979 at NIE offices in Washington, D.C. This Monograph provides readers with an opportunity to evaluate the basis upon which federal government agencies determine the feasibility of using a computer simulation model as one of several policy analysis methodologies in response to a Congressional mandate and very specific policy problems.

The Monograph is separated into four descriptive sections. Section 2 describes the human resource development and employment program reference system modeled by TWS. Some specific policy issues TWS can address are discussed in Section 3. Section 4 outlines how TWS works, while Section 5 examines national data files available for TWS parameterization. The Monograph is purposefully trimmed and focused to facilitate a broad based-policy value review of an operational TWS.

2. The Reference System of TWS

The reference system for TWS includes: education at secondary, postsecondary and adult levels; CETA programs; employment programs; public transfer programs; a labor market and a labor force. The Monograph is particularly concerned with providing a comprehensive policy capability for vocational education; thus, it will be described first.

Vocational education in the United States consists of a large number of programs designed to prepare students for entry into a variety of occupations. For example, the vocational education program electrical technology (USOE Code 16.0107) is designed to prepare students for at least three U.S. Census coded occupations, draftsmen, power station

operators or electric and electronic engineering technicians. Vocational programs are offered at the secondary, post-secondary and adult level and are from one to three years in length.

Vocational education in the United States is governed by the Vocational Amendments of 1976 (PL 94-482). The major tenets of this legislation are:

(1) That vocational education programs prepare persons for employment in occupations for which there is a demand, and;

(2) That vocational education programs be coordinated with employment and training programs under the Comprehensive Employment and Training Act of 1973 (CETA).

PL 94-482 targets federal funding on age groups within the population (Section 103), with 50% of program support for persons 15-19; 20% for students 20-24 and 15% for students 25-65. It also targets support to disadvantaged and handicapped students, as well as students with limited English speaking ability (Section 110). Sex discrimination for enrollments in programs from automechanics to homemaking is expressly and repeatedly forbidden; still, the essential thrust of PL 94-482 is to provide an elaborate planning and monitoring mechanism to assure the Congress that vocational education in every city and town in the United States is preparing students with skills and abilities required in high demand occupations, that vocational education students enter the fields for which trained and that such vocational education programs are maximally coordinated with CETA programs.

As an example of how PL 94-482 demands coordinated planning between vocational education and CETA programs, sections 162 and 105 create national and state advisory councils, with a major responsibility to report to the U.S. Congress on the "extent to

which vocational education, employment training, vocational rehabilitation and other programs under related Acts represent a consistent, integrated and coordinated approach . . ." The first responsibility of the National Occupational Information Coordinating Committee (Section 161) is through "the use of program and employment data, to improve coordination between and communication among administrators and planners of programs authorized by the Act and the Comprehensive Employment Training Act of 1973 . . ." Section 106, the General Application Provision, requires States to "describe how the activities proposed . . . relate to the manpower programs . . . under the Comprehensive Employment and Training Act of 1973. . . to assure a coordinated approach to meeting the vocational education and training needs of the area or community." The Annual Program Plans and Accountability Reports of Section 108 requires states to describe the "coordinating of programs funded under this Act with manpower training programs. . ." Section 161 of PL 94-482 states that the Vocational Education Data System be compatible with CETA programs.

The Comprehensive Employment and Training Act of 1973 (as amended in 1978) is becoming a very significant part of the human resource development process in the United States. For example, the federal outlay for all CETA titles totaled 9.5 billion in fiscal 1979,[7] the total 1978 expenditure for elementary and secondary education was about 92 billion, approximately 10% of which was federal.[8]

CETA now offers a broad range of training and employment services, ranging from counterstructural (Title II) and countercyclical (Title VI) public service training programs to private sector employment programs (Title VII) and extensive employment training programs (Title II). Title IV is the Youth Employment Development Projects Act of

1977 (YEDPA). The clear purpose of YEDPA is to find alternatives to the traditional academic and vocational education programs for large segments of the youth population to help them obtain and maintain meaningful jobs. The range of demonstration projects is impressive: (1) The Youth Incentive Entitlement Pilot Project (YIEPP) provides target groups of students from 16-19 with jobs if they return to school; (2) The Youth Community Conservation and Improvement Project (YCCIP) offers out of school youth supervised work experiences of community benefit, targeted on 16-19 year old youth with difficulty in finding employment: (3) the Youth Employment and Training Program (YETP) seeks to improve the employment prospects of disadvantaged youth age 16-21, usually through work experience or work experience and classroom training programs; (4) the Young Adult Conservation Corps (YACC) is patterned on the CCC; it provides youth of ages 16-23 who are unemployed and out of the labor market with opportunities to work on conservation projects; (5) the Job Corps is an intensive training experience for young persons who are poor, out of school and out of work - its historic goal has been to break the intergenerational cycle of poverty; and (6) the Summer Program for Economically Disadvantaged Youth (SPEDY) provides summer work for targeted groups of youth, providing students with opportunities to learn job skills and work attitudes through meaningful work. In addition, an incredible range of discretionary projects under YEDPA are being tested to discover alternative programs to assist youth in becoming productive members of the labor force.[9] These programs are a part of the Knowledge Development Plan of the Department of Labor; they represent a timely development for a TWS application (see Section 3, Policy Issues for TWS.)

Coordinating employment and training programs with education and other intervention programs has long been a goal of the Department of Labor. As early as 1973 Eli Ginzberg argued for coordinated planning among manpower programs, education and other intervention programs:(10)

> But there is a broader perspective from which one must view the whole question (employment and training program issues); the interaction of the manpower programs with such other important national efforts as improving the educational system, creating good race relations and reducing poverty. Indeed, all these efforts are essential to and inseparable from one another. For instance, the manpower programs have been part and parcel of efforts to remove discriminatory barriers and of the pressure on education policy makers to concern themselves with the career potential of students.

Employment programs establish eligibility criteria for specific jobs; such policies might also create jobs. Accordingly, counter-structural public service employment programs (Title II), counter-cyclical public service employment programs (Title VI), private sector job opportunities (Title VII)* and some YEDPA programs of CETA can all be classified as employment programs. The Work Incentive Program for AFDC recipients has a tax credit scheme for private sector employment. The Target Jobs Tax Credit under the Revenue Act of 1978 is an employment program; it is aimed at the structurally unemployed and provides tax credits for employing persons who fall within target groups. Like Title VII of CETA, it is geared to the private sector.

*For an interesting discussion see: "An Enlarged Role for the Private Sector in Federal Employment and Training Programs", National Commission for Manpower Policy, 6th Annual Report, Washington, D.C., 1978.

Affirmative action policies and immigration programs are employment programs. Affirmative action programs are motivated by equalization goals; immigration policies, in part, are based on estimations of human resource shortfalls for specific occupations.

Table I brings together the important human resource development and employment programs included in TWS and some of the target groups for whom policies are formulated. Table I also includes job service and vocational rehabilitation programs. It does not represent the public transfer programs of TWS.

Although it seems clear that human resource development and employment programs are potentially precise social instruments, it appears obvious that, taken together, they represent an enormously complex structure. In fact, complexity is the major argument in favor of initiating TWS as a planning tool. Without a policy tool like TWS in place, it is difficult to imagine exactly how policy persons could ever estimate the expected range of effects for a specific program, say less vocational education at the secondary level for various target groups of students.

Not shown on Table I is the TWS labor market. The labor market of TWS is, in part, based on "queue theory" as advanced by Thurow,[11] but includes the criticism of the Thurow construct offered by Holt;[12] the queue theory tends to depress price as a deciding factor in labor market choice.

Congressional and bureaucratic rhetoric aside, planning for human resource development and employment programs has occurred on an isolated basis: this is not only true among education, training and employment programs, but within each program area. Yet each human resource development and employment program functions within an interdependent

Table I

Suggested Target Groups and Program Choices for Human Resource Development and Jobs Programs in the United States

Descriptors to Sort Target Groups for Policy	Human Resource Development and Jobs Programs
Beginning High School Stud. Sex Ability SES Residence Race Health Age	**Education Programs** **Secondary School Programs** General Academic College Preparatory Vocational Agriculture Distributive Home Economics Health Programs Office & Business Trades and Industrial **Postsecondary School Programs** Apprenticeship Programs Program List Vocational Programs One Year Program List Two Years Program List Two Year Academic Programs Program List Four Year Colleges Academic Science Engineering Health Agriculture Business Language Government **Graduate Programs** Master's Degree Program List Doctorate Program List **Adult Education** Program List
High School Dropouts Sex Ability SES Residence Race Health Age Age of dropout U. S. Program	
High School Graduates Sex Ability SES Residence Race Health Age U. S. Program Achievement in U. S.	
Beginning Postsecondary Stud. Sex Ability SES Residence Race Health Age U. S. Program Achievement in U. S.	
Postsecondary Completers and DO's Sex Ability SES Residence Race Health Age P.S. Comp. Status P.S. School Type P.S. School Program P.S. School Achiev. Family Status	
Beginning CETA Client Sex Ability SES Residence Race Health Age Educ. Attains. Educ. Achiev. Work Experience Family Status Milt. Experience	**CETA Programs** Title II Employment and Training Work Experience OJT Classroom Training Combination Programs Countercyclical PSE Title IV Youth Employment and Demonstration Projects Act Job Corps Youth Incentive Entitlement Pilot Project (YIEPP) Youth Community Conservation and Improvement Project (YCCIP) Youth Employment & Training Program (YETP) Summer Program for Economically Disadvantaged Youth (SPEDY) Young Adult Conservation Corps(YACC) Field Test Title VI Countercyclical PSE Title VII Private Sector Opportunities for Economically Disadvantaged
CETA Completer or DO Sex Ability SES Residence Race Health Age Educ. Attain. Educ. Achiev. Work Experience CETA Prog. CETA Comp. Status Family Status Milt. Experience	
Employed Sex Health Race Residence Age Ability Educ. Attain. Family Status Work Experience Occupation Milt. Experience	**Work Incentive Program** **AFDC Recipients** Labor Market Referrals Information OJT PSE
Unemployed Sex Health Race Residence Age Ability Work History Educ. Attain. Family Status Occupation Type Unemployed Structural Frictional Cyclical Milt. Experience	**Job Service** Interviews Labor Market Information Referrals Counseling and Testing
Out of Labor Force Sex Health Race Residence Age Ability Work History Educ. Attain Family Status Occupation Hist. Time out of Labor Force Milt. Experience	**Vocational Rehabilitation** Services and training to help handicapped obtain employment
	Employment Policies Targeted Jobs Tax Credit Under Revenue Act of 1978, tax credits are allowed to firms that hire persons who meet eligibility requirements Affirmative Action/Equal Opper. Hiring practice influenced by ratio of employees to ratio of qualified persons in the labor market by sex and race. Immigration Recruiting non-citizens to join workforce in specific occupations.

NOTE: Residence includes both geographic (Texas or Maryland) and community (large suburb or small town).

system. A change in the future transitional probabilities for a target group caused by the intervention of a single program has an impact on all programs. New human resource development or employment programs like YEDPA represent new choices for target groups within the population; the impact of these choices will change the future stream of life/career transitions for members of target groups of persons and have "ripple effects" on other programs and target groups in the population. For example, the implementation of YEDPA programs, together with upscaled compensatory, basic education programs at the secondary level, might allow vocational education to concentrate its capability on a student population with a high probability of succeeding in technology oriented vocational programs and occupations.

Indeed, it is difficult to imagine how planning for any single set of human resource development or employment programs can be seriously advanced without a careful consideration of the likely impact on other programs, major subgroups within the population, the labor force and public transfer programs. Given the wide variety of human resource development and employment programs, target groups of persons, the complex work force and geographic size of the United States, it seems self-evident that without a computerized simulation model to help the policy community calculate estimations of policy impact, policy recommendations for individual programs will continue to be made on an isolated basis. This is the policy void TWS is designed to fill.

3. Policy Issues for TWS

TWS is a generalized capability; once it becomes operational it can address a wide range of policy issues. Still, it is critical that TWS

development be responsive to very specific policy concerns on behalf of named agencies. If TWS can be useful to "in-place" policy persons as they respond to Congressional mandates, it might survive as a permanent policy tool.

Policy examples are described for vocational education and CETA programs, which include the coordination of education, training and employment programs. Using TWS as a planning device for specific target groups like the structually unemployed or poor female heads of families is examined. A planning problem is presented which considers relationships between occupational information systems, which attempt to project labor supply/demand futures for the economy, and TWS, which focuses on the transitions of target populations through human resource development and utilization programs and into and out of the labor force. Finally, a new use of TWS is offered which allows the policy community to estimate the impact of funding distribution formulas for vocational education within the total structure of TWS.

a. Upscaling or Downscaling Vocational Education Programs for Specific Target Groups

TWS allows policy experiments to simulate the longitudinal economic and lifestyle impacts of specific vocational education programs on named groups within the population, e.g. poor females who live in large cities, have above average general academic ability and are enrolled in high school as freshmen. One might experiment with increasing the

probabilities for this target group of students to select specific vocational programs in high school, say electronics, computer programming or drafting. This is called an upscaling experiment. Historic experience is used to estimate the new career/life transitional probabilities for these students based on taking specific vocational programs, compared to previous high school program selections. In this case, the programs they would have selected are downscaled. The rest of TWS is held constant; comparisons on the descriptive output tables between status and experimental conditions describe in detail the impact differences between policy and status conditions.

TWS estimates the cost of high school programs under status and experimental conditions, as well as earnings and public transfer costs for the policy target group and the entire population under status and experimental conditions. It also estimates labor force and labor market conditions under fixed, future conditions, based on occupational information system predictions. TWS is geographically segmented, thus, the regional effects of national policy can be estimated by state. The national effects of regional (or state) policy for specific target groups can also be estimated. In this case, the policy example is national, i.e., all females who are poor, live in large cities, have above average academic ability and are high school freshmen. We could have selected just black females in the Northeast who are poor, live in large cities, have above average academic ability and are high school freshmen for the simulation experiment.

Policy experiments for vocational education at the secondary level would begin with single target groups, with results compared to status conditions. More advanced experimentation would include multiple

target groups; for example we might begin with just black center city females of high academic ability who are poor. A second policy experiment might increase the probability of average ability black males who are poor and live in the center city to enroll in specific vocational education programs, say plumbing and pipefitting and machine shop programs. Such an experiment might not necessarily result in downscaling the programs in which these students were previously enrolled; we might decide to transfer persons less likely to achieve in these vocational programs back to general academic programs in the high school where they might take a compensatory basic education program and a YEDPA program. Under such an expanding policy experiment, those low ability students who are transferred (in simulation) to general academic and YEDPA programs in high school might eventually qualify for enrollment in vocational programs.

Such vocational education experiments can include introducing new program components. A compensatory, basic education program can be introduced for students who do not qualify for vocational education under new, simulated policy conditions, or a cooperative program can be introduced within vocational programs. Cooperative programs might seem particularly useful for program experimentation because they provide vocational students with very specific job skills required on existing jobs in particular industries, while school based vocational programs present more generalized vocational skills and work attitudes within a vocational program area. For example, one might wish to experiment with high school programs for poor females who live in large cities, have average general academic ability, and

enroll in electronic and computer programs with and without senior year cooperative programs.

Such experiments for vocational education can be conducted at the secondary, postsecondary and adult level for any target group within the population. These experiments can be conducted in simulation, before recommendations are made to the Congress of the United States for program changes in the real world.

b. Coordinating Planning for Vocational Education among Secondary, Postsecondary and Adult Levels

Relationships in planning among secondary, postsecondary and adult vocational education programs seem particularly critical. Does a strong secondary vocational program tend to reduce the need and expense for postsecondary programs? If so, is it true for all vocational programs and all target groups or just some? Which occupational groups and which target groups? Does upscaling secondary vocational education programs flood the labor market with undertrained workers? Is this true for all occupations? Is it true for all target groups? Does postsecondary vocational education upgrade the labor force during business downturns? Does both a strong secondary and postsecondary vocational education program represent overkill? From an equity perspective, how are students being tracked under various policy conditions for secondary and postsecondary vocational education programs in terms of family socioeconomic status (SES)? What might be the unexpected results of downscaling secondary and postsecondary vocational education programs for low ability students, without upscaling compensatory, basic education programs and YEDPA programs?

These are but a few of the policy issues that should be investigated before comprehensive policy recommendations for a coordinated secondary, postsecondary and adult vocational education plan can be advanced to the U.S. Congress. It is important such advice anticipate the probable impact of various policy recommendations under alternative future occupational demand conditions and estimate the public transfer consequences of these policy recommendations. The likely effect of policy for vocational education programs at each level should be estimated on other human resource development programs, including CETA and higher education. TWS should help the policy community present a basis for a unique legislative rationale on behalf of increasing or decreasing support for vocational education at the secondary, postsecondary and adult level and the broader implications of such policy alternatives.

c. Coordinating Planning for Vocational Education, CETA Programs and Employment Programs.

According to the Carnegie Council on Higher Education's recent Giving Youth a Better Chance, 50% of youth between the ages of 16-21 are not in formal education. They recommend a National Youth Service Foundation to coordinate existing programs and services to deal with what they describe might become a "self-perpetuating culture of poverty". Youth unemployment is running around 30%, worse for minorities.

The Department of Labor is attempting to translate its Knowledge Development Plan under Title IV (YEDPA) of CETA into policy and practice. It is the recommendation of the National Commission for Employment Policy that such programs be turned over to prime sponsors and

made operational.[13] The Department of Labor stresses the need for linkages between vocational education, basic, academic education and YEDPA employment training programs.[14] New youth initiative legislation programs seek an additional billion dollars for YEDPA programs and a billion dollars for basic, compensatory education and vocational education during FY81. A White House Task Force has been working on coordinating education, training and employment programs for youth. Indeed, it is not difficult to document the rhetoric, at least, for more coordinated planning among vocational education and CETA programs; Congressional intent was made quite clear in PL 94-482.

Such coordinated planning requires information about the transitions of target groups of persons through education, training and employment programs and into and out of the labor force. It is difficult to imagine how such planning can occur without estimating these transitions in a comprehensive structure like TWS.

To explore how TWS might be used, we will expand a bit on the example presented in Policy Example (a). There is evidence to suggest that vocational education is successful as a compensatory program.[15] Some argue that the compensatory components of vocational education, if they exist, are its major advantage[16]. Still, as an example, let us assume that YEDPA planners decide to estimate the number of students by major target group to be served by employment and training programs under explicit occupational demand conditions. They may decide to define potential clients who, as some educators put it, "slip through the cracks", as not only dropouts but students who have a high probability of completing high school and a high potential of becoming a

"part of the self-perpetuating culture of poverty". Experiments with an operational TWS can estimate the numbers of these students by target group characteristics and region within the United States; let us assume that many would be enrollees in general academic and vocational high school programs.

Coordinated policy planning among vocational education, general education and CETA planners might result in simulating the outcomes of downscaling enrollments in vocational education and general academic programs by the approximate number of students in the specific target groups who have a low probability of work force success. Such students would be transferred into programs which YEDPA had tested in its Knowledge Development Plan; some of the programs might include more intensive compensatory education in high school and some form of YEDPA program. YEDPA programs might be organized so that they seek to return target groups of students to vocational programs wher they demonstrate a high probability of achieving in a vocational program. Such a series of policy experiments would allow vocational educators to consolidate growth and concentrate efforts on students with a high probability profile for achievement in school and advancement in the occupations for which trained.

Such a YEDPA policy experiment would have enormous impact on the practice of vocational education at the secondary, postsecondary and adult level; conversely, if vocational education decided to rearrange its goals as described above, it would be bound to have grave implications for general education and YEDPA programs. It seems unwise to plan for vocational education or CETA youth programs in isolation if a coordinated planning capability is possible. Such isolated planning is blind to the comprehensive impact of policy recommendations.

Planning for "down the line" CETA and employment programs requires information about "up the line" planning of vocational education, general education and YEDPA programs. Planners for Title II, Title VI and Title VII of CETA programs must know which target groups are going to "slip through the cracks" of planned education and YEDPA programs. If CETA planners can estimate which target groups of persons are likely to "slip through the cracks" of YEDPA and education programs under various policy and occupational demand conditions, they can plan employment and training programs with increased confidence. Without information about the transitions of target groups of persons through "early on" education and employment/training programs, it is difficult to plan and bring on line, CETA programs for young and middle aged adults when they are needed. It is just as difficult to anticipate needs for older adults.

Two fundamental questions permeate education, training and employment program planning. First is the question of productivity, which is a function of human resource skills and technology. TWS provides no direct measure of productivity; it does provide a way to plan for arranging the characteristics of the queue of potential workers for major occupations. Independent evidence about the relationship between worker characteristics by occupation and productivity could be useful in policy decisions. Equality of occupational opportunity is a second important policy concern. What are the systematic relationships between target group's sex, SES, ability, minority status, place of birth, etc. and various career development paths through programs of intervention and into and out of specific occupations in the work force. TWS is

very useful in estimating human distribution consequences of various policies for education, training and employment programs.

Planning for WIN programs, vocational rehabilitation programs, and immigration programs requires information about the transitions of target groups of persons through prior intervention programs and into and out of the labor force. Immigration programs, for example, depend on quite specific information about target group transitions and occupational demand shortfalls, by specific occupations, e.g., medical doctors or bricklayers. In the absence of such information, immigration policy could result in taking jobs from trainable target groups within the United States or leaving serious gaps in the occupational structure.

TWS is designed to facilitate coordinated planning among all agencies concerned with human resource development and utilization. TWS provides individual agencies with a capability to estimate the effect of policy for a particular agency on the programs of other agencies without disturbing responsibilities for program management. In addition, TWS allows for national planners to estimate the state by state effect of policy or for states to anticipate the effects of national policy. TWS can be used to monitor the unfolding of status conditions for all human resource development and employment programs.

d. Planning with TWS for Individual Target Groups.

Up to now, we have considered using TWS as a planning tool for policy issues primarily concerned with advancing recommendations for specific programs of intervention like vocational education, CETA programs or immigration. Some planners might want to use TWS to plan

for a specific target group like female heads of families who are poor, perhaps building on the work of Sawhill and others.[17,18] Some might want to use TWS to isolate the various groups which comprise the structurally unemployed and, on a target group by target group basis, isolate the mix of individual characteristics and career intervention experiences that predict becoming structurally unemployed. One of these groups might be female heads of families who are poor. TWS policy experiments might attempt to upscale programs which tend to prevent persons from becoming poor female heads of families or programs which are successful in helping female heads of families from becoming non-poor. Indeed, the structurally unemployed are a diverse group for which individual policies must be sought for major target groups. Such planning could range over all human resource development and employment programs, both in-place and experimental. Calculating the public transfer payments under various policy experiments would be important to such experiments. Individual policy recommendations which resulted from such simulation experiments would be specific to future occupational demand conditions, as is the case with all TWS experiments.

e. Occupational Information System and Planning with TWS.

Occupational demand is important in anticipating the scope and thrust of human resource development and employment programs for target groups in the population. Occupational demand is segmented by occupational sector within the economy and geographic region within the United States. These differences in occupational demand are represented in TWS, i.e., future occupational demand conditions can be

exogenously read into TWS for policy experiments. Indeed, many policy experiments with TWS might involve restructuring occupational demand or job structures along with human resource development programs to offer comprehensive policy recommendations. TWS permits policy persons to experiment with various occupational demand futures by major occupational category and region. For such experiments, human resource development or employment programs can be held constant or, as previously stated, experiments can include both new policies for transitions of target groups through different sets of career development experiences and new occupational structures. These could be important experiments for persons concerned with equalization outcomes of education, training and employment policy.

A brief example of planning with TWS which takes full advantage of the labor force sector is now offered. As Ms. Summers points out, (see pg 51), occupations for which labor supply has "adjustment problems" are those for which supply information is important. These are also the occupations for which education and training programs are necessary and for which it is important to understand the transitions of target groups through education and training programs and into a successful career within the labor force.

For instance, if it is true that a major bottleneck in developing solar energy is a shortage of technically skilled workers on the professional and subprofessional level, specific, energy related occupations should be identified and vocational and professional programs upscaled to meet energy work force needs in the future. TWS experiments would help identify target groups that are most likely to succeed in

vocational and professional education programs designed to produce the needed work force. Perhaps something like the talent search of the 1950's in the United States is required. Such a policy might even result in a selected immigration policy, if shortfalls are identified in terms of persons likely to be ready for work on some sort of a "production schedule". TWS experimentation would consider the effects of such a "crash project" for technically skilled workers on the balance of the occupational structure so that human resource development and employment programs could be "fine tuned" accordingly. An emergency program might have a major growth impact on the labor force for a ten year horizon without any job restructuring; on the other hand, some labor intensive energy development projects might be initiated for target groups within the population who would appear to be surplus under projected future conditions.

Such experiments could be conducted on a state by state basis, if policy recommendations were to be suggested at that level. Still, national policy recommendations with guidelines to states, based on criteria that can be cross-referenced to national norms, might be just as effective. Much would depend on the rate with which TWS is developed.

f. Federal Funding Levles and Vocational Education Enrollment Changes.

The future relationship between various levels of federal funding for vocational education in the United States and enrollments in vocational education is an important policy consideration. Enrollments can be construed to be total enrollments in all vocational education

programs, enrollments within specific vocational education programs like auto mechanics or commercial art, or enrollments within specific vocational education programs by target groups, females of low academic ability enrolled in office education programs in the Southeast.

Up until now, costs for vocational education programs and other intervention programs, as well as earnings, have been exogenously read into TWS; they can be easily changed with each experiment. For these policy experiments, we would propose a new development within TWS, incorporating within TWS the funding distribution formulas for vocational education at federal and state levels, with total levels set exogenously. The balance of funds required to meet funding goals would be construed to be local. Such an addendum to TWS should include "taxable wealth behind the child" in the state, so that the proportion of taxable state wealth can be estimated under various policy conditions. The detailed expenditure distribution data from the 15 states to be generated by the Berkeley Project funded by the Vocational Education Study could be of great value for this section of TWS. If estimations are obtained for LEA distributions of funding by the Berkeley Project, they could be used as values in TWS.

This TWS development would allow the Vocational Education Study to test a range of policies by setting per pupil expenditure levels and changing the formulas for funding distributions by the federal and state governments. (Some estimations must be made for private expenditures, particularly at the postsecondary level, in terms of tuition and/or loans.) These policy experiments are fundamentally different than all those described in prior policy experiments. This TWS application is very similar to the use of microsimulation by the Congressional Budget Office

and the Administration in estimating the costs of public transfers.[19] By setting per pupil expenditure limits and total funding limits, TWS would provide information of human distributional outcomes of various federal funding formulas. One would expect substantial differences among states. It is possible to combine experiments. For instance, a policy person might first change the federal funding formula for vocational education to learn the estimated effects on enrollments in the states. On the other hand, one might begin experimenting with target groups and then adjust simulated funding formulas at the state and federal level to achieve an equitable funding mechanism to support a desired enrollment pattern.

For policy recommendations that suggest changing future patterns of federal funding for vocational education either in the aggregate or for target groups like the disadvantaged or handicapped, TWS experimentation would be most helpful in advancing understandings about likely outcomes. Such policy experiments also would be extremely useful in experimenting with funding alternatives among vocational program levels, i.e., secondary, postsecondary and adult; or for program components, e.g., cooperative programs, guidance, etc. Federal funds can also be concentrated on specific vocational programs, say occupations for which there is a large demand. One could indeed make a strong case that the federal government has a responsibility to perform simulations which estimate the impact of new funding proposals for each state and provide the consequences to states before new legislation is introduced. One could also argue that policy recommendations for changing the level of federal funding for one federal program should present estimations of the impact

on other federal programs. Persons concerned with education as an equalizing agent should have a profound interest in such TWS experiments.

If this experimental capability were added to TWS, we would also include a discount capability. In that way, the impact of inflation can be discounted in calculating the distributional effect of funding formulas.

Changing federal funding for vocational education requires addressing questions beyond the scope of TWS. For example, will reducing the total amount of federal support send an unexpected signal to the states about the utility of vocational education, even though the federal government only supports about 10% of the total costs? A basic policy question is that if federal funding for vocational education is reduced, will states and local communities continue to support vocational education and at what level. PL 94-482 tries to exert enormous control on the goals and structure of vocational education in every state (see page 5). Reducing the proportional level of federal support for vocational education is likely to influence the control the federal government is able to have on state and local vocational education programs, making vocational education less responsive to national policy.

Even though TWS cannot be useful to every policy issue in relation to changing federal funding levels, it can be helpful in estimating many important distributional consequences of such policy recommendations in terms of effects on states, target groups, occupations and "downstream" programs of intervention, including public transfer programs. Estimating the impact of federal funding alternatives on specific target groups like center city blacks seems particularly critical. Some outcomes

might be quite unexpected in many states, particularly states whose funding distribution formulas are not responsive to community wealth or do not target on student characteristics.

Although data requirements for parameterizing TWS are discussed in Section 5, it seems appropriate to point out here that to obtain and build into TWS the state distributional formulas for educational funding within each state and the totals allocated under various laws seems quite uncomplicated. It is quite another thing to learn how funds are actually used at the local level or the proportion of local funds applied to specific programs. Still, in spite of the difficulties, it seems to be a task worth trying, particularly in light of the Vocational Education Study contract with Berkely. It is a perfect use of a microsimulation model and makes maximum use of the Berkeley Project data.

4. How TWS Works

TWS is a microsimulation model.* Microsimulation models draw on the work of Boudon[20] and more particularly, Orcutt[21,22]. Micro-

*As a result of the December 17, 1979 meeting in Washington, D.C., I had decided to include a technical section on microsimulation as a part of this Monograph. My intention was to address issues of model validity and error within TWS and to discuss differences among model types, particularly differences between path analysis, an advanced application of multiple regression, and microsimulation. To many educational researchers and economists, concomitant variations and path coefficients of path models are simply more familiar that a stochastic model based on conditional probabilities. Such a discussion would have to include purpose, scope, flexibility, utility, data organization and availability, validity, error, etc. I have decided not to include such a discussion within this Monograph; it is simply not consistent with the central thrust of the presentation. The bibliography provides a rich reference source to operations research and microsimulation for methodologists unfamiliar with this extensive literature. I am grateful to colleagues John A. Creager and Michael S. Garet for suggestions in the form of technical memoranda for such a discussion. Colleagues and I plan to present a paper at the American Educational Research Association in Boston, Massachusetts in April, 1980 which addresses technical issues of microsimulation. We hope that this paper will add to the general literature in this area; it is a more appropriate form for such a discussion.

simulation models are constructed from the discrete experiences of groups of persons; dynamic microsimulation models reflect the longitudinal stream of experiences for a sample of a named reference population. TWS is a dynamic microsimulation model which allows a simulated sample of the population to record its own history as it experiences various futures. The structure of the model consists of the relevant experiences of the modeled population and the resulting history created by the simulated sample of persons.

Decisions for simulated persons within TWS are called stochastic; the probability of a future action for a named group is determined and the computer draws a random number to specify choice, i.e., TWS is driven by a so-called Monte Carlo property.

As a general, operational statement, a status model is developed which represents significant real world conditions for the modeled population. In the case of TWS, the model consists of career relevant experiences over a lifetime. Policy persons can experiment with the choice of target persons to select an experience, say vocational education for an increased percentage of center city females of average academic ability in the Southwest. The policy person can specify a particular program, say auto mechanics, and a completion rate, as well as an initial placement rate into a specific occupation(s) directly after graduation for the named target group. The experiences for the simulated sample of target persons under experimental conditions are compared with those of a sample who experienced "status" conditions on one of over fifty output tables which record the history of each policy experiment. Output tables are designed for each application to be sure they reflect the information needs of the policy community.

Dynamic microsimulation was purposefully selected as the model structure for TWS because it allows policy persons to experiment with target groups of the population in a way that can reflect the impact of programs on the longitudinal career/life transitions of target groups of persons. Since macro human resource development policy is really a summation of micro policies for target groups of persons, a microsimulation model appears to be a useful type of model for policy advice. TWS presents the policy persons with a structure very much like the one they face in the real world. Policy persons can simulate new program experiences for a target group of persons in a region, state or for the nation as a whole, but all other relationships in the longitudinal stream of development remain the same, except for the impact of a particular policy on a target group of persons.

Not all microsimulation models are dynamic; some are static. Static microsimulation models do not allow for longitudinal experimentation with the simulated population.[23,24] Macrosimulation models and continuous flow models, i.e., econometric models and Industrial Dynamics, respectively, deal with the sums of behavior like GNP, households, interest rates, tax revenues, etc., and, accordingly, are not appropriate policy tools for analysis which depends on knowledge of discrete decisions for unique groups of the population. Figure 1 is a macro representation of the TWS environment. Understanding the rates of flow of all persons among these experiences could be important. TWS models system behavior at the level of the individual target group, e.g., white females of low ability, who live in large cities and are unemployed,

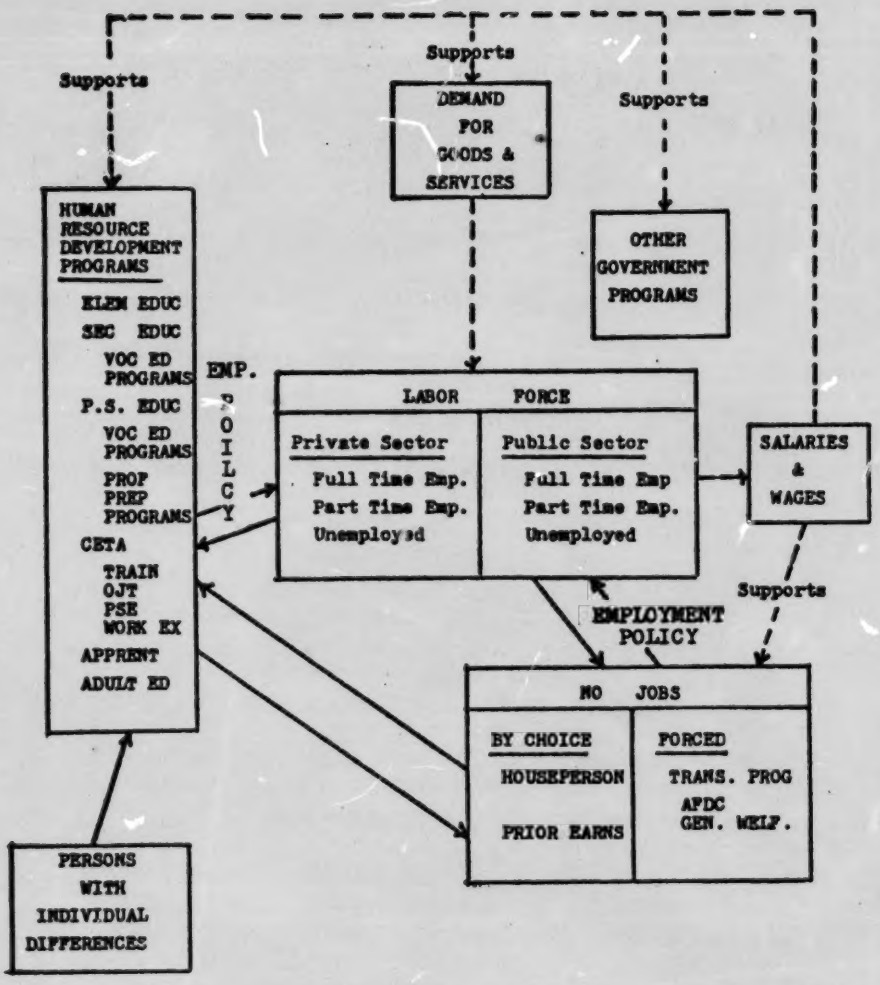

Figure 1

A Macro Representation of
The Transition to Work Simulator Environment

and individual programs, e.g., a specific vocational program at the secondary level. TWS is designed to support policy at this level. Macro models are useful for certain aspects of many policy issues; so too are non-dynamic microsimulation models. Dynamic microsimulation models focus on the consequences of the discrete and longitudinal behavior of target populations; macroeconomic conditions must be exogenously "read in".

Microsimulation models are becoming widely used by government in the United States. The Office of Assistant Secretary for Planning and Evaluation of HEW has supported the development of both static and dynamic microsimulation models for use in estimating public transfer programs and revenues. Such models are used for planning by the Federal Energy Administration; Social Rehabilitation Services, the Congressional Budget Office; the Food and Nutrition Service. the Department of Agriculture [25] and the Social Security Administration.

A TWS model is a longitudinal stream of career experiences for a target population; TWS simulates a sample of that population. A decision table within TWS provides a choice to select an experience for members of the simulating population; TWS simulates one person at a time. The conditional probabilities which determine choice selection for a career related experience are determined by a simulee's past experience.

Figure 2 represents a typical decision table within TWS; Select a Secondary School Program.

FIGURE 2

Example of a TWS Decision Table

Select a Secondary School Program

	Constant	Black	General Ability	Female	Center City	Parent's SES
General Academic Program	37%	+5	-16	-3	+2	-13
College Preparatory Program	43%	-13	+29	-10	+7	+24
Vocational Program	20%	+8	-13	+13	-9	-11

Reference Group

White
Average General Ability
Average SES of Parent
Not City
Male

The data in Figure 2 are based on data of the National Longitudinal Study of the Class of 1972 (NLS/72) conducted by HEW's National Center for Educational Statistics; the analysis was conducted by the author. Before simulees select a high school program, they would have selected a sex, race, general ability, socio-economic status of parents (SES) and residence in a center city. If a simulee is a member of the reference group, i.e., white, male, average general ability and SES for parents and not from a center city, he has a 37% chance of selecting a General Academic Program, a 43% chance of selecting a College Preparatory Program and a 20% chance of selecting a Vocational Education Program.

Each of the columns on the decision table are called predictors. A predictor is included on a decision table because it is assumed to influence the choice among the decision alternatives for a group of simulating persons. Predictors establish a unique set of conditional probabilities for each simulee at each decision point in a TWS application. For example, if a simulee had previously chosen to be a female, TWS would algebraically add the percentage scores (weights) in the column female to those of the reference group found in the column labeled constant. Predictor weights can be estimated in a variety of ways. The weights in Figure 2 were determined by using weighted data with controlled cross-tabs, e.g., the distribution for white, female, average SES and ability and center city were subtracted from the reference group distribution among choices. Multiple regression can also be used as a method to estimate weights. The conditional probabilities for a female of average general ability and SES who is white and not from a center city to select a high school program are: General academic program, 34%; College Preparatory Program, 33%; and Vocational Program, 33%.

If a predictor does not apply to a simulating person, it is counted as zero and not added to the conditional probabilities at a choice point for that simulating person; all simulating persons do not have the same prior experience. Simulating persons may have a high (+1), average (0) or low (-1) general ability or SES. A low general ability would increase the probability of attending a Vocational Program (-) X (-) = (+) by 13% in Figure 2; the same convention holds for SES. As a check, the summed conditional probabilities for a simulee at a decision point

must be equal to 100%, the weights for each predictor must always be equal to 0 when summed; what is taken from one choice must be distributed to other choices. This is particularly important to remember when conducting a policy experiment with TWS.

A test of your understanding of how a decision table functions is to arrange the weights so that all females must select a College Preparatory Program in Figure 2. The weights would be: General Academic Program -73%, College Preparatory Program +125%, and Vocational Program -52%. You have just worked through the calculations for a policy experiment with TWS. It should be pointed out that this has not been an exhaustive seminar on policy changes with TWS; it takes about a day to struggle through all the alternatives.

Every decision table within TWS is exactly like the one shown in Figure 2; some have more choices, select an occupation; some have more predictors; select a primary life activity at age 24. Every time a simulated person makes a choice for an experience that has an associated cost (private or public) or benefit, it is remembered by TWS (economic benefits are limited to earnings or public transfers). TWS can simulate either a single cohort or an entire population, depending upon the application.

Appendix I presents selected output tables from an adaptation of TWS done for Wisconsin. These output tables were designed for the Wisconsin application; over 50 tables were designed to record the history of simulated populations. Appendix II contains a flow diagram of decision points for TWS. Sensitivity tests have been conducted with TWS. They are important in learning about the behavior of the model.

5. Available Data to Parameterize TWS

A persistent question associated with the development of TWS is the availability of data to estimate conditional probabilities on TWS decision tables and other functions within TWS. Whether or not sufficient data exist to estimate parameters for TWS, sufficient data must exist to estimate the consequences of new policy for the future of vocational education, CETA programs, WIN programs, vocational rehabilitation programs and employment programs because such policy is always in the state of development. It hardly seems likely that the National Institute of Education will not submit a report to the U.S. Congress presenting future recommendations for vocational education because of data limitations. It seems more unlikely that the U.S. Congress will not "mark up" new legislation for vocational education in the 1980's.

The very best response to the charge that there is not sufficient data to parameterize an operational TWS is that if there is sufficient data to parameterize the several thousand isolated and largely unknown "in the head" models on which policies for vocational education and other human resource development and employment programs have been and are being based, then there must be sufficient data to estimate values for a single, comprehensive and logical model of the entire human resource development and utilization reference system. Indeed, many argue that if there were no data at all, the construction of a computerized model which represents the logic of the reference system and "expert estimated" parameters would represent a significant advance to the policy process for vocational education, other human resource development programs and employment programs. Such a policy tool would

provide the policy community with a calculating capability beyond that which is remotely possible in the heads of a thousand people, even if they communicated in an open and explicit way. It would provide some notion of the comprehensive consequences of policy recommendation for human resource development and employment programs within fixed occupational demand futures.

It is probably true that a group of "experts" could guess parameters in the right direction for each sector of the model, i.e., the model would represent the cumulative experience of a group of authorities from a range of fields (labor economics, vocational education effects, individual differences, etc.). In fact, some models are based on such parameters, with sensitivity tests used to determine the relative strength of various parameters within sectors of the model. When the model "appears" rational and is predicting current conditions, it is judged to be valid for policy purposes.[26] It is argued that such models provide useful insights into the structure of an entire system, the very process of developing the model is of value to the policy community. The computerized model organizes the collected "expert opinion" into a single, logical environment for policy experimentation within an entire structure that would not be otherwise possible.

TWS provides the policy community with all the advantages of a computerized, mathematical representation of the complex reference system of human resource development and employment programs within an environment that includes a labor market, a labor force and public transfer programs. In addition, it provides the policy community with a computerized model structure for which conditional probability parameters can be estimated from empirical evidence generated by social

science research and judged to be valid by experts. TWS allows data from a variety of sources to be pooled into a single data file to parameterize TWS.

The "pooled data" base must be understood as an important part of TWS. It is a new product which is of great value in explaining historical relationships within the modeled reference system, in this case the human resource development and utilization structure within the United States. The organization of such a data base is an important task in developing a TWS application. An operational TWS should be a powerful stimulus in developing better data for policy. If nothing else, the sheer embarassment to government of not being able to estimate critical parameters for TWS, while, at the same time, spending something around 7% of a GNP over 2 trillion dollars each year on human resource development programs ought to provide some stimulation to develop better policy tools.

There is not enough focused data in the United States to develop a full blown TWS as suggested in this model. The fundamental question becomes: is there enough data focused on reference system components, e.g., vocational education, CETA, labor force, etc., to initialize a policy useful model now? The answer to that question is an unequivocal and resounding yes!

Before naming the individual data bases that can be organized together into a single, micro data base to parameterize TWS for policy consultation now, some observations seem useful. The first observation is that the mathematical-logical structure of TWS will be developed, in part, independent of available data. Only those parts of the model

for which sufficiently valid data exist will be activated, other parts will be activated as more data become real. It is a rather straight forward process to add predictors and choices on decision tables, it can be done "interactively" at a computer terminal with an operational TWS. It is more difficult to "patch-in" decision tables, output tables and functions, e.g., funding formulas, thus "it pays" to develop a fairly comprehensive model structure with an application.

Secondly, the fundamental criterion for initiating TWS ought to be: Does it provide new and important information to the policy process for human resource development and employment programs? The single purpose of this Monograph is to inform readers so they can make a decision. If TWS provides a better estimation of the future consequences of human resource development and employment programs than is now available at a reasonable cost, and, at the same time, facilitates more coordinated planning among agencies at state and federal levels, sufficient argument should exist for its development.

Although it is the intention of the author to keep this Monograph non-technical, some discussion of error estimation seems unavoidable. Explaining the effects of social intervention programs like vocational education and YEDPA programs requires experimental research conditions which are almost impossible to attain. Such research requires the random assignment of "subjects" to experimental and treatment groups and should be conducted on a double-blind basis, i.e., neither the subjects nor program persons should be influenced by the research process. Such conditions are possible with rats, in some medical

applications and, on a decreasing basis, for some psychological research. It is rarely possible in the social environment in which education, training and employment programs are offered.

An extensive literature in educational research is testimony to this reality; the Department of Labor seems to be now struggling with these same issues that have been the focus of experimental psychology and educational research over the last 50 years. Indeed, DOL has engaged the Educational Testing Service to evaluate some of its YEDPA discretionary programs.(27)

Consequently, experimental and survey research has introduced statistical controls and comparison groups because it is not possible to control through research design. Such controls introduce error into findings. Findings are also contaminated by measurement error; sampling error exists when trying to generalize to population values. Unexplained variation haunts social scientists, i.e., the frustrating experience of only being able to explain part of an effect. Indeed, the very concept of causation remains a contested issue among methodologists.

Knowledge is not absolute; it typically takes the form of an "<u>if this, then probably that</u>" syllogism. Research in the social sciences attempts to assess the probabilities of the this and that relationship, often there is more than one this, sometimes there can be more than one that. Research findings are usually reduced to some form of probability estimation; if this then the chances of that are 95 out of 100. For some applications, policies require that researchers be 99% sure, in many instances evidence of some positive or negative relationship among explaining and explained variables is helpful. This is the typical outcome of social science research.

There is no doubt that there is error in TWS output tables. The question is: Does a status run of TWS predict better than chance or a roll of the dice? The answer is not totally clear. If estimated error is not misrepresented in the model and if differences between status and experimental policies exceed error bands, TWS would seem to provide trustworthy advice. Considerable sensitivity testing must be performed with a mathematical model before it is made operational; such testing is vital in understanding the characteristics of a model. Sensitivity testing with TWS has indicated that error tends to attenuate over model time, not grow or cascade, as we had feared.

It is a fair criticism that TWS will not explain all the causes for any effect within the model. Predictors for conditional probabilities are limited to existing knowledge. As knowledge expands, so will TWS.

The operational components of status TWS must be developed with trustful data which have known error characteristics. Put another way, the constraints of developing an operational TWS are the policy issues to be addressed and existing data.

TWS can use both longitudinal and cross-sectional data. Longitudinal data, which tracks the same unit of analysis over time, is most useful, but if the time frame is too long, one must suspect the constancy of the environment. Cross-sectional data measures units at one period of time; the U.S. Census is cross-sectional. Such data does provide estimations for transition matricies of target groups from age group to age group for reasonable periods of time, say 6 or 7 years forward. Put another way, one would expect about the same transition probabilities for a target group of 19 year olds, say center city blacks who are unemployed, in 1984 as existed in 1980, i.e., in the absence of a simulated

or real intervention program. TWS can also use results of evaluation research projects for specific intervention programs. These findings attempt to explain the independent effect of a program on target groups of the population. Of course, TWS can use program expenditure and demographic data in representing costs and certain conditional probabilities. A TWS application must be producing real world conditions before it is considered valid for policy advice. Policy persons must not only understand the error inherent in TWS advice, they must judge the value of operationalizing TWS against existing policy information.

Finally, TWS ought to be developed by a step by step basis. Unless TWS is the property of the several agencies which have responsibility for human resource development and utilization policy, it is not likely to survive a single application. Developing an administrative structure for TWS so that it can be responsive to various agencies is no easy matter.

Each generation of TWS development will produce a more comprehensive model with more trusting results. Continued development will also contribute to a generation of policy persons increasingly able to take full advantage of TWS advice. In the beginning, one cannot expect the United States Congress and others to act on <u>independent</u> TWS advice. Still, the first national application should have a direct influence on policy in some very definite way, i.e., policy recommendations will be less provincial and impact better understood.

The following is a short description of data bases in the United States available to parameterize TWS. It must be remembered that a single, TWS micro data base will be constructed from the several data bases described below. Without an operational TWS, it is not likely that a comprehensive micro data base for the historical analysis of education, training and employment programs will ever be organized and maintained. None has to date. One could argue that the absence of such information contributes to the continued fragmentation of program planning.

Existing data bases are not consistent with specific sectors of TWS, thus the data files will not be presented by model sector. The selection criterion for variables from each data base is relevance to model logic. The supporting TWS micro data file will be larger than the list of initial model predictors and functions to be parameterized to facilitate analysis for model precision and growth.

The National Center for Educational Statistics

The National Longitudinal Study of the High School Class of 1972

NLS72 is a longitudinal survey of about 18,000 1972 high school seniors with four follow-ups: 1973, 1974, 1976 and 1979. There are about 3,000 items of information on most sample members, including personal background, school experience, aspirations, occupational and life history for seven years after high school. This national survey identifies vocational high school program in some detail, i.e., agriculture, business, distributive, health, home economics, and trade and industrial, it does not disaggregate high school vocational programs beyond this level. Earnings information is thoroughly reported. As

is the case with most education surveys, follow-up data are self-report from mailed questionnaires; the Department of Labor tends to interview respondents. The NLS72 sample is not large enough for disaggregation for state-reliable analysis; data can be analyzed at the regional level. NLS72 does not allow for the estimation of dropouts, the sample includes only seniors. In spite of these weaknesses, NLS72 is an excellent account of the transition of high school students from school to work. It can be used to parameterize a substantial part of the first seven years of TWS for many target groups within the modeled population.

A recent review of NLS72 analysis lead to the following statement:[28]

> It is the opinion of the writers that some of the more substantive promise of the data (NLS72) will grow out of the regimen that causal modeling procedures may impose on the investigator. One needs an iterative regimen with which to confront the potential interactions of a variety of independent variables, not just one or two of particular interest, in a framework where this year's dependent variables become next year's independent variables. In short, an essentially cross-sectional examination of current survey, with a few prior classification variables thrown in, is not equivalent to the full promise that the data afford.

As an editorial aside, this is not only true for NLS72, but for the potential micro data base which could be organized now to support a single model like TWS. NCES plans to launch a new longitudinal survey soon, called "High School and Beyond". The sample will be almost twice as large and high school 10th graders will be included.

EDSTAT The National Center for Educational Statistics has two demographic data files which constitute EDSTAT (educational statistics), ELSEGIS and HEGIS.* Although these data files are very aggregate and based on a complex reporting process which is bound to introduce substantial error, these data do provide demographic estimates for educational programs at the elementary, secondary and postsecondary level which will be useful to some TWS parameters and/or functions. The so-called VEDS data set, which provides estimates of enrollments, expenditures and 6 month follow-up information for vocational education, is a part of this data set. The VEDS data should begin to stabilize in 1980.

American Institutes for Research

Project TALENT In 1960 a national sample of about 440,000 high school freshmen, sophomores, juniors and seniors were identified and followed up on a 1,5 and 11 year basis. These data are rich with psychological variation, but less descriptive of the high school vocational programs than NLS. Follow-up data are not as strong in terms of economic impact as NLS72; nonetheless, Project TALENT provides a comprehensive documentation of high school graduating classes of the early 1960's. Because of its age, it has limited value for TWS; still, some relationships between psychological variation, school experience and economic and life activities 11 years after high school remain relatively constant.

The American Council on Education

ACE initiated a longitudinal study on a cohort that entered college in 1966, including junior and community colleges, and followed them up in 1971. These national data include ability, SES, college program

*Elementary and Secondary General Information System and Higher Education General Information System.

and post college experience. Like Project TALENT, the ACE66 data file is now old. Still, it does provide some useful information about transitions from high school to college and into the labor force for many target groups.

In parameterizing an initial version of TWS, a micro data file from NLS72, Project TALENT and ACE66 was developed. The file includes the first two follow-ups for NLS72 and all three follow-ups for the senior class of the TALENT file. This resource is still available to parameterize TWS; it greatly reduces the work that would have to be done on NLS72. Persons who have done research with large data files should realize the value of this micro data file.

The Department of Labor

Survey research by the Department of Labor tends to be less focused on human variation and less descriptive of school experience than those of education, but they are more descriptive of economic and occupational history. Typically, follow-up data are carefully gathered by the Department of Labor from interviews.

The National Longitudinal Surveys The National Longitudinal Surveys (NLS's) include four cohorts that have been longitudinally surveyed since 1966; two national cohorts are for middle aged men and women, two are for young men and women. A national sample for boys and girls (ages 14-21) was added in 1977, to have a particular focus on Title IV of CETA. These cohorts are of great value to TWS because of their recency. Although the number in the NLS's cohorts is small, thus restricting the target groups for whom analysis can be performed, NLS's represent a rich source of data for parameterizing TWS, both for transitions from

school and employment training programs to work and transitions of middle aged persons into and out of the labor force.

The unit of analysis for NLS72, Project TALENT, ACE66 and NLS's is the individual. This provides enormous flexibility in using these data bases for parameterizing TWS. Taken together, the data from these national, longitudinal surveys describe the experience of target groups for various age cohorts from 1960 through 1979. A micro data file comprised of critical variables from these surveys would document about two decades of school-career transitions for individuals, NLS's extend this knowledge through early retirement. NLS72, Project TALENT, and NLS's have been summarized by Grasso and Shea[29], along with other, small national surveys.

The Continuous Longitudinal Manpower Survey CLMS interviews about 15,000 new CETA enrollees annually. The data includes information about the experiences of respondents one year before entry into funded CETA programs; it is a national sample of all CETA programs, including youth programs. The unit of analysis is the individual; the data file includes demographic data on each respondent, e.g., educational attainment sex, race, etc. Follow-up interviews for many respondents occur at 6, 18, and 36 month intervals after program entry. These data files provide a thorough record of work history, earnings and public transfers received. It is possible to separate CETA clients who have experienced vocational education within this extensive data file. CLMS includes a comparison group drawn from the Current Population Survey; a public use file will be available during the summer of 1980. These data seem to provide a detailed estimation of the impact of CETA programs: they will be of great value for parameterizing the CETA sector of TWS.

Knowledge Development Plans A large funding commitment by the U.S. Congress to the Department of Labor has been made for discretionary experimentation with a wide range of employment and training programs for youth, targeted on the disadvantaged. The rationale behind this investment was that such programs would be carefully evaluated so that they could be up-scaled to prime sponsors to meet the needs of both youth and the economy. "In fiscal 1978 and 1979, the major emphasis was placed on 'knowledge development' through a structured array of multisite demonstration projects, large-scale evaluations and coordinated research efforts".[30] This is to be a one-time investment, with a large dissemination effort of developed knowledge to prime sponsors. The use of data from the Knowledge Development Plan for expanding YEDPA programs is a perfect application for TWS; fortunately these programs have been well evaluated by the Employment and Training Administration of the Department of Labor. Results of these evaluations can be used in estimating transitions for target groups of persons into and out of YEDPA programs and into the next career/life experience. TWS provides a broad setting to examine the consequences of the Knowledge Development Plan in a way that consequences of YEDPA programs can be estimated for both target groups and other programs of intervention, e.g., vocational education, other CETA programs, public transfer programs, etc.

Other Useful Data Files

The Bureau of the Census of the U.S. Department of Commerce has a public use micro data file called the Survey of Income and Education; an enormous national sample of 151, 170 households. SIE has become an important intercensal, state level survey for dealing with issues of public assistance, poverty, health insurance, etc. This rich, cross-sectional data file includes all persons over age 14; it includes

detailed measures of labor force status, earnings, public transfers, and basic demographics like age, race, sex, educational attainment and ethnic origin. SIE includes a detailed description of family characteristics, bilingualism and health conditions. By organizing the file by target group characteristics, say black, urban males who are heads of families and employed in certain sectors of the labor force, it is possible to estimate conditional probabilities from one age level to the next, for many important career activities, e.g., to be employed in the same job next year, to be married next year, to be ill next year, etc. Selected variables from this data file would be particularly useful within the mid-career sector of TWS for many target groups. It would also be useful to "fill-in" the age 14-21 sector of TWS with transitional estimations not available in the longitudinal studies. SIE would be very valuable if we decided to extend TWS through end career.

The Bureau of the Census also conducts the Current Population Survey; a monthly survey of households.* The so-called March CPS Supplement of the CPS is of major importance to TWS. Although less comprehensive than SIE, the March CPS Supplement includes a wide array of information of great interest for TWS parameterization; including age, sex, race, ethnic origin, family characteristics, educational attainment, mobility, detailed work and employment experience, etc. In addition, CPS March Supplements are available on an annual basis. The CPS data would be organized just like SIE information for TWS; the sample size is not large enough to allow state-reliable estimations.

User tapes from the 1980 decenial census conducted by the Bureau of the Census will be of great value in parameterizing TWS when they

*CPS is a cross-sectional survey, with some longitudinal properties.

become available. The decenial census is much more thorough than CPS or SIE; it allows disaggregation to state levels. Such data would be used to expand and revalidate many sectors of an operational TWS in the mid 1980's.

The Michigan Panel Study on Income Dynamics is a 12 year old, longitudinal survey of families that might be of some interest for TWS parameterization. It is a national survey; its longitudinal design allows the estimation of transitional probabilities for a longer time span than cross-sectional studies. It has a focus on low-income families; it could be particularly useful for long trend transitions for some target groups within the population. This survey is administered by HEW; a new survey has been initiated by HEW and will be carried on by the Social Security Administration. It is called the Survey of Income and Program Participation; it should be available for use by 1982. This is a national survey developed to focus on participation in health and public transfer programs. It is being designed to "fill in cracks" of existing surveys for policy planning; some parts of the survey would be helpful to parameterize probabilities for target groups to participate in public transfer and health programs.

TWS can also use data from experimental studies like the YEDPA programs for parameterization. TWS provides a base to experiment with the broader consequences (up-scaling) of implementing an experimental program.* It is probably true that if an experimental program has not produced sufficient information to be tested in TWS, it has not demonstrated that it should be considered for implementation in the real world.

* One of many good examples would be: Shiller, Bradley R., "Lesson from WIN: A Manpower Evaluation, Journal of Human Resource Development, 13/4. Fall 1978.

The information source for occupational demand data is the Bureau of Labor Statistics. Occupational information systems consist of current and future estimates of new workers required by occupation, including the number of projected job openings and workers available to fill projected job openings. Occupational demand is a function of labor force separations and economic growth; supply information is generated by summarizing the entrants for a particular occupation willing to work at a given wage at fixed points in time.

The Bureau of Labor Statistics has made remarkable progress during the last decade in developing through its Occupational Employment Statistics Program a cooperative federal/state effort to provide information which describes in great detail the occupational structure of the labor force, including current and future job openings by industry for the nation, states and within-state regions. The system is well documented by BLS; it represents a substantial research and development effort.

As pointed out by Dixie Summers:[31]

> The concept of labor demand and supply information appears deceptively simple when job openings and entrant's data appear side by side . . . The measurement of job openings is in fact a relatively straight forward process, even through complicated problems are involved in the actual accomplishment of the task . . . Measurements of separations from an occupation are susceptible to statistical treatment as probabilities. We generally speak of separation rates for death and retirement, which in fact are probabilities based on methods and historical information of various quality. The process of estimating job openings resulting from employment growth has been conceptually reduced to economic models of varying degrees of sophistication which rest on a relatively substantial data base. Measurement of job entrants, in contrast, has resisted attempts at economic modeling, partly because no comprehensive data base exists and partly because of the nature of the job entry process.

Ms. Summers suggests that certain occupations should be identified for study of supply flows based on two criteria:

(1) Difficulties in supply easily adjusting to new demand levels;

(2) Problems of social and economic costs associated with surplus supply.

Planning for human resource development and employment programs requires information about job openings and as much information about potential supply for particular jobs at given wage rates at future points in time as exists. Even though current occupational information systems are subject to error,[32,33] they provide the planning community with useful information about future job openings for many occupations. This information is important in planning for education training and employment programs. TWS is designed to include occupational demand estimations as developed by the Bureau of Labor Statistics.

Occupational information systems do not provide policy guidance about the historic or expected transitions of target groups of persons through various human resource development and jobs programs and into and out of occupational and geographic sectors of the labor market. Once the policy community has the best estimates of future demand ratios by industry, occupation and region, they must plan an efficient way of providing education and training opportunities for future workers to obtain job skills, work attitudes and job information. Such planning must consider not only the needs of the future work

force to meet production expectations, but the social values of equalizing job distribution opportunities in a way that maintains excellence in the work force. This planning must also provide for training, transitional work experiences; created employment and public transfer programs for those who fail to compete successfully in the labor market at various points in future time. Such policy should estimate economic, social and occupational impacts.

The Vocational Education Study is developing an "objective and authoritative" account of the distribution of public funds to support vocational education. These data will be based on a national sample, and describe the distribution of funds at both the state and local educational agency level. Findings from this study can be translated directly into TWS, thus providing a much more accurate estimation of expenditure patterns as a part of TWS logic. As previously described (see pg. 23), by adding this component to TWS, experimentation can estimate the economic and human distributional effects of various funding schemes for vocational education. The Vocational Education Study is also examining the effects of vocational education on students from national, longitudinal data files; this project might result in a data file that could be of value to parameterizing TWS.

6. Conclusion

This is a Monograph without an ending. Candidly, the point of the Monograph is to persuade NIE and others that TWS ought to be implemented. The Monograph is purposefully geared to the policy community for education, training and employment programs. It attempts to make several points:

(1) TWS can help planners estimate the human distributional effects of policy for education, training and employment programs; such estimations are important before policy is implemented;

(2) TWS can help planners coordinate planning among all human resource development and employment programs in a way that is responsive to economic conditions; coordinated and responsive policy is in the best interest of the United States and its citizens;

(3) There are sufficient data available to parameterize an operational TWS now, even though early generations will be developed in less detail then many users would like. In fact, an operational TWS should become a powerful stimulate for more focused data, as agencies will have an increased incentive to explain the effects of their programs.

It is probably true that a majority of the readers of this Monograph will never know if TWS becomes a policy tool or not. That decision will be based on luck and leadership by a very few. The most important factor in deciding if TWS becomes an operational policy tool is its congruence with the "law of the situation." In spite of the difficulty of organizing a several agency policy project at the national level that is meaningful, if the arguments for doing TWS as advanced in this Monograph are true, TWS will probably become implemented in some way or another. It is amazing how the "law of the situation" usually prevails.

Appendix I

Appendix I consists of example output tables designed for the Wisconsin application of TWS. Tables 1 - 14 are for the state as a whole; output tables for the entire nation would be like these tables. Tables 15 - 22 are broken down for regions within Wisconsin; for a national application, these could be state tables. Output tables for a TWS application are designed as a part of the development process.

TABLE 1

AVERAGE ANNUAL PER PERSON OUTCOMES FOR WISCONSIN SIMULEES

(Values Are Dollars)

	SEX		SES			ABILITY			RACE		FOSTER CHILD	AFDC CHILD	ALL
	M	F	Low	Med	High	Low	Med	High	NW	W			
GROSS EARNINGS													
SALARIES & WAGES													
SOCIAL COSTS													
AFDC COSTS													
GENERAL WELFARE COSTS													
GROSS CETA COSTS													
PUBLIC SERVICE EMPLOYMENT COSTS (TITLE VI)													
NET CETA COSTS													
UNEMPLOYMENT COSTS													
JOB SERVICE COSTS													
WIN COSTS													
VOCATIONAL REHABILITATION COSTS													
COLLEGE OPPORTUNITY COSTS													
CORRECTIONS COSTS													
EDUCATION COSTS													
MEDICAL COSTS													

Notes: Gross Earnings = All Government + Private Transfers

Social Costs = Education + CETA + WIN + Job Service + Corrections + Unemployment + AFDC + General Welfare + Vocational Rehabilitation + Medical

College Opportunity Costs = Foregone Earnings + Cost

Net CETA = Gross CETA Less Productivity

TABLE 2

AVERAGE YEARS PER PERSON IN SPECIFIED ACTIVITIES
FOR ENTIRE SIMULATION OF WISCONSIN SIMULEES

(Values are Years)

	SEX		SES			ABILITY			RACE		FOSTER CHILD	AFDC CHILD	ALL
	M	F	Low	Med	High	Low	Med	High	NW	W			
FULL-TIME EMPLOYED													
PART-TIME EMPLOYED													
UNEMPLOYED													
AFDC													
GENERAL WELFARE													
CETA (NON-PSE)													
CETA (PSE)													
IDLE													
EDUCATIONAL ATTAINMENT													
PRISON													
VOCATIONAL REHABILITATION													

TABLE 5

FUNDING SOURCE FOR ENTIRE SIMULATION IN WISCONSIN

(Values are Dollars)

		GOVERNMENT					
		FEDERAL	STATE	COUNTY	LOCAL	PRIVATE	TOTAL
ELEMENTARY + SECONDARY	GENERAL & COLLEGE PREP						
	CAPSTONE						
POST SECONDARY IN WISCONSIN	VTAE						
	UWISCONSIN						
	INDEPENDENT						
	APPRENTICE						
AFDC							
GENERAL WELFARE							
JOB SERVICE							
VOCATIONAL REHABILITATION							
CORRECTIONS							
CETA							
UNEMPLOYED							
WIN							
TOTAL							

Notes: (1) HEAB loan treated as private investment.

(2) HEAB grant treated as State investment.

(3) When simulee selects postsecondary school, he selects tuition cost. Tuition cost less grant treated as private investment.

(4) When simulee selects public postsecondary school, average operating costs per person are assigned to simulee. Same for elementary and secondary, public or private.

(5) Table weighted to cohort population values.

TABLE 8

PERCENTAGE OF SIMULATED WISCONSIN POPULATION SERVED BY CETA, WIN, CORRECTIONS AND VOCATIONAL REHABILITATION PROGRAMS

(Values are Percentages)

CETA	SEX		RACE		SES			ABILITY		
YOUTH ACT	M	F	NW	W	Low	Med	High	Low	Med	High
YETP (WORK EXPERIENCE + CLASSROOM)										
YETP (WORK EXPERIENCE ONLY)										
YACC										
YCCIP										
YIEPP										
SUMMER YOUTH										
JOB CORPS										
CLASSROOM TRAINING										
WORK EXPERIENCE										
ON THE JOB TRAINING										
PUBLIC SERVICE EMPLOYMENT										
DIRECT PLACEMENT										
WIN										
CORRECTIONS										
WORK RELEASE										
STUDY RELEASE										
VOCATIONAL REHABILITATION										
PHYSICAL THERAPY										
CLASSROOM TRAINING										
TECHNOLOGICAL ASSISTANCE										
ON THE JOB TRAINING										
MEDICAL										

Values = $\frac{\text{Number Served (All Years)}}{\text{Entire Cohort (All Years)}}$

TABLE 14

WISCONSIN PUBLIC AGENCY BALANCE TABLE PER SIMULATION

(Values are Self Evident)

	CLIENTS SERVED	EXPENDITURES PER CLIENT	TOTAL EXPENDITURES
ELEMENTARY + SECONDARY EDUCATION			
POSTSECONDARY EDUCATION			
VTAE			
UWISCONSIN			
CETA (NON PSE)			
CETA (TITLE VI PSE)			
WIN			
JOB SERVICE			
AFDC			
GENERAL WELFARE			
VOCATIONAL REHABILITATION			
UNEMPLOYMENT INSURANCE			
CORRECTIONS			
MEDICAL			

TABLE 15

AVERAGE OUTCOMES PER PERSON
(Values are Dollars)

	WISCONSIN DISTRICTS								
	1	2	3	4	5	6	--	--	TOTAL STATE
GROSS EARNINGS									
SALARIES & WAGES									
SOCIAL COSTS									
AFDC COSTS									
GENERAL WELFARE COSTS									
UNEMPLOYMENT COSTS									
CETA COSTS									

Notes: (1) This table can be repeated for males, females or total.

(2) This table can be repeated for Administrative Districts, VTAE Districts and CETA Prime Sponsor Districts.

(3) This table is the equivalent of Table 1, but disaggregated by district.

TABLE 17

UNEMPLOYMENT RATE BY DISTRICTS
(Values are Percentages)

	WISCONSIN DISTRICTS									
YEARS	1	2	3	4	5	6	--	--	--	--
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Notes: (1) Unemployment Rate =

$$\frac{\text{Unemployed}}{\text{Unemployed + Full Time Employed + Part Time Employed}}$$

(2) This table can be repeated for VTAE Districts, Administrative Districts and CETA Prime Sponsor Districts.

TABLE 18

TOTAL OUTCOMES PER COHORT

(Values are Dollars)

WISCONSIN DISTRICTS

	1	2	3	4	5	--	--	--	TOTAL STATE
GROSS EARNINGS									
SALARIES & WAGES									
SOCIAL COSTS									
AFDC COSTS									
GENERAL WELFARE COSTS									
UNEMPLOYMENT COSTS									
CETA COSTS									

Notes: (1) This table can be repeated for males, females or total.

(2) This table can be repeated for Administrative Districts, VTAE Districts or CETA Prime Sponsor Districts.

(3) This table is the equivalent of Table 3, but disaggregated by district.

TABLE 20

AVERAGE PERCENTAGE
OF SIMULATED WISCONSIN POPULATION IN OCCUPATION
BY DISTRICT FOR ALL YEARS OF SIMULATION

(Values are Percentages)

		WISCONSIN DISTRICTS									TOTAL FOR STATE
		1	2	3	4	5	6	--	--	--	
OCCUPATIONS	SCIENCE PROFESSIONAL AND KINDRED										
	MEDICAL PROFESSIONAL AND KINDRED										
	ALL OTHER PROFESSIONAL AND KINDRED										
	ENGINEERING										
	ALL TECHNICAL AND KINDRED										
	MANAGERS & OFFICIALS										
	SALES WORKERS										
	CLERICAL WORKERS										
	CONSTRUCTION CRAFT & METAL WORKERS										
	ALL OTHER CRAFT WORKERS										
	OPERATIVES										
	SERVICE WORKERS										
	LABORERS										
	FARMERS AND FARM WORKERS										

Notes: (1) This table can be repeated for VTAE Districts, Administrative Districts and CETA Prime Sponsor Districts.

(2)

$$\text{Value} = \frac{\text{The sum of the number in occupation and district for all simulation years}}{\text{The sum of the number of all simulated persons for all years (In State)}}$$

TABLE 22

RATIO OF JOB SEEKERS TO JOBS AVAILABLE
DURING SIMULATION BY OCCUPATION BY DISTRICT

(Values are Percentages)

	WISCONSIN DISTRICTS									
	1	2	3	4	5	6	--	--	--	ALL
SCIENCE PROFESSIONAL AND KINDRED										
MEDICAL PROFESSIONAL AND KINDRED										
ALL OTHER PROFESSIONAL AND KINDRED										
ENGINEERING										
ALL TECHNICAL AND KINDRED										
MANAGERS & OFFICIALS										
SALES WORKERS										
CLERICAL WORKERS										
CONSTRUCTION CRAFT & METAL WORKERS										
ALL OTHER CRAFT WORKERS										
OPERATIVES										
SERVICE WORKERS										
LABORERS										
FARMERS AND FARM WORKERS										

Note: Job seeker is defined as seeking primary desired occupation in district of residence each year. Jobs sought in other districts or other occupations are not counted.

$$\text{Value} = \frac{\text{Number of Job Seekers (All Years)}}{\text{Number of Jobs Available (All Years)}}$$

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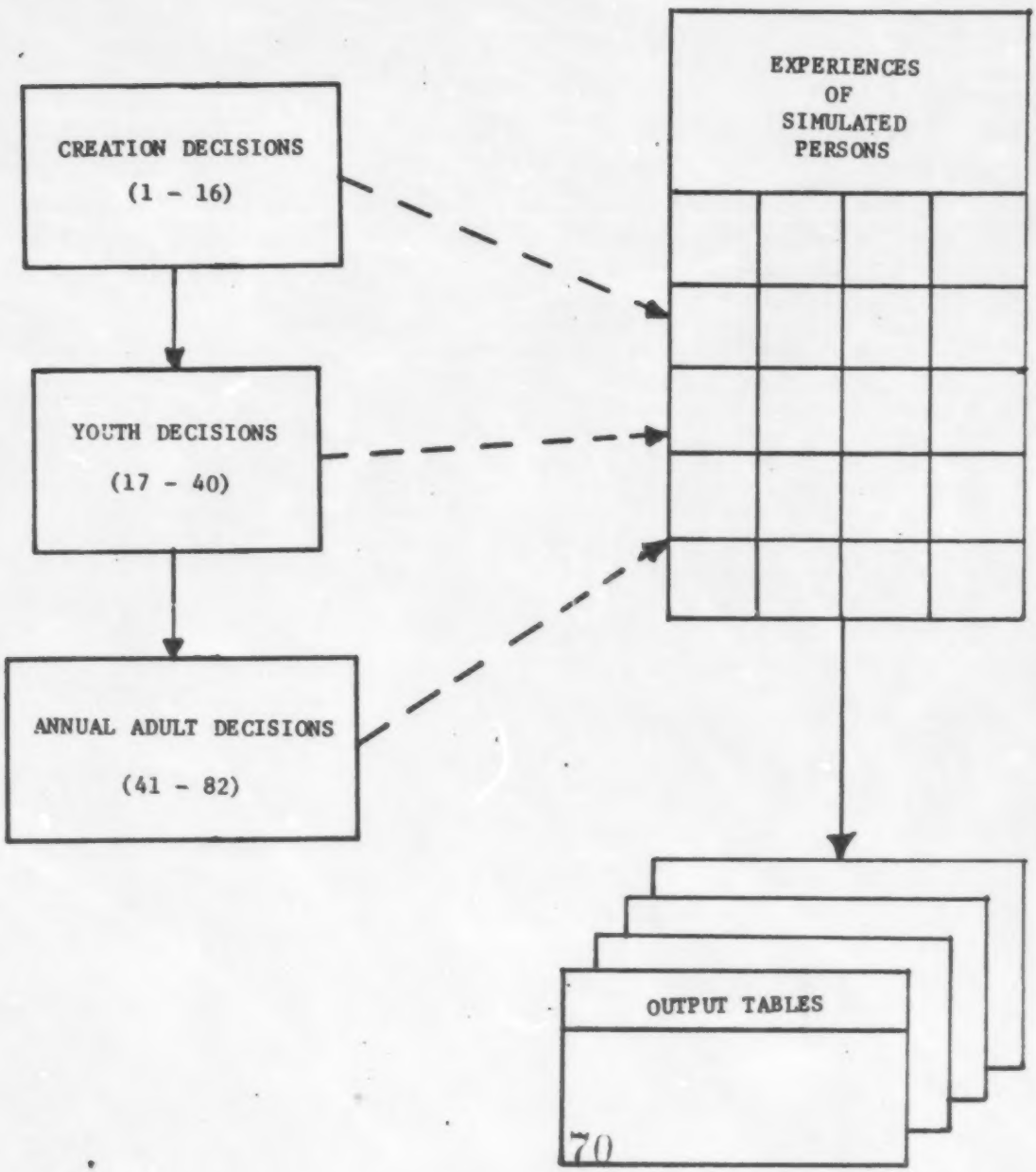
Appendix II

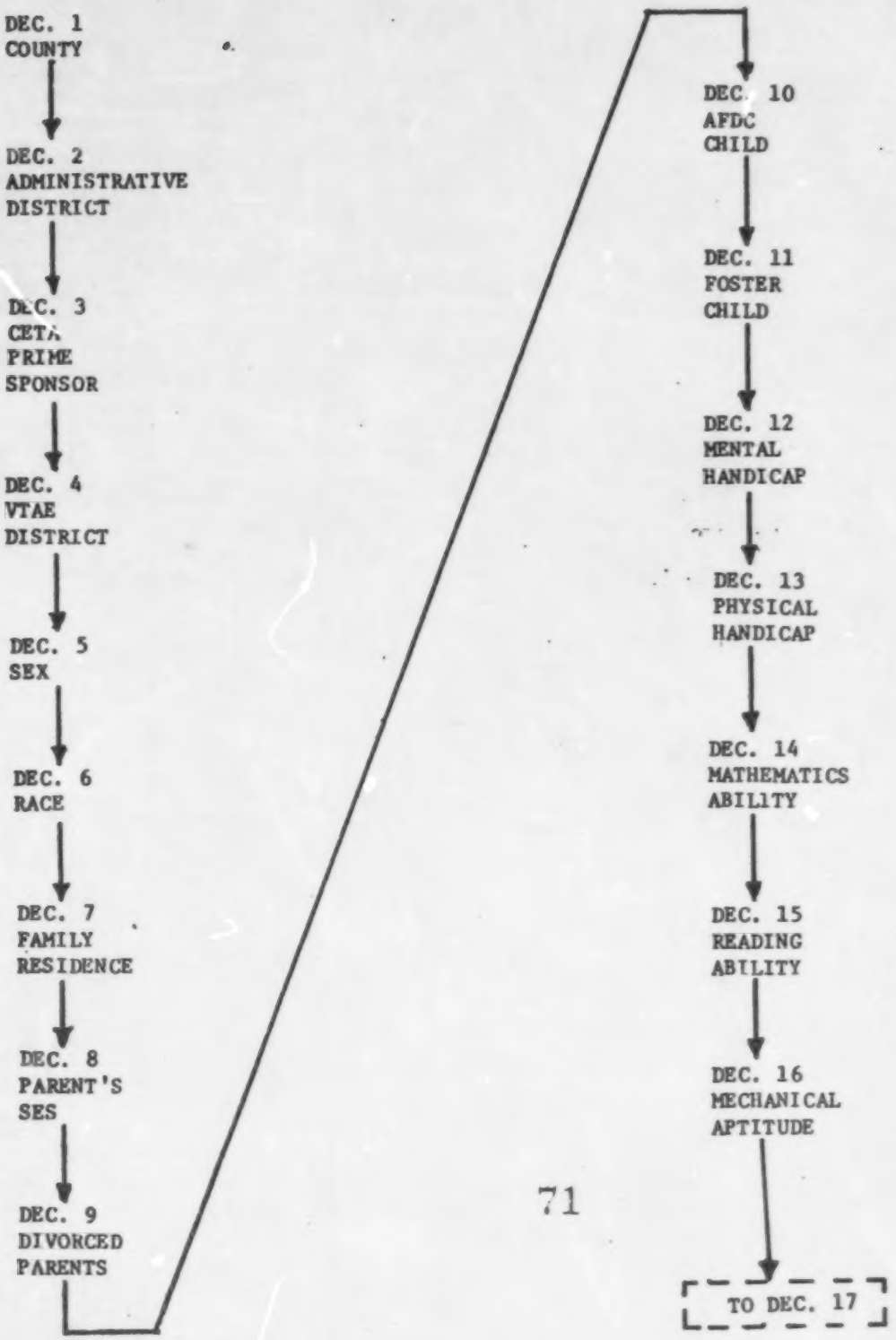
Appendix II consists of a flow chart of decision tables within the Wisconsin application of TWS. Each of the 82 decision tables has predictors and choices just like the example decision table described in the text of the Monograph. Decision 63 of the adult section is broken out in detail. Decisions 47 - 56 describe an early representation of the TWS labor market.

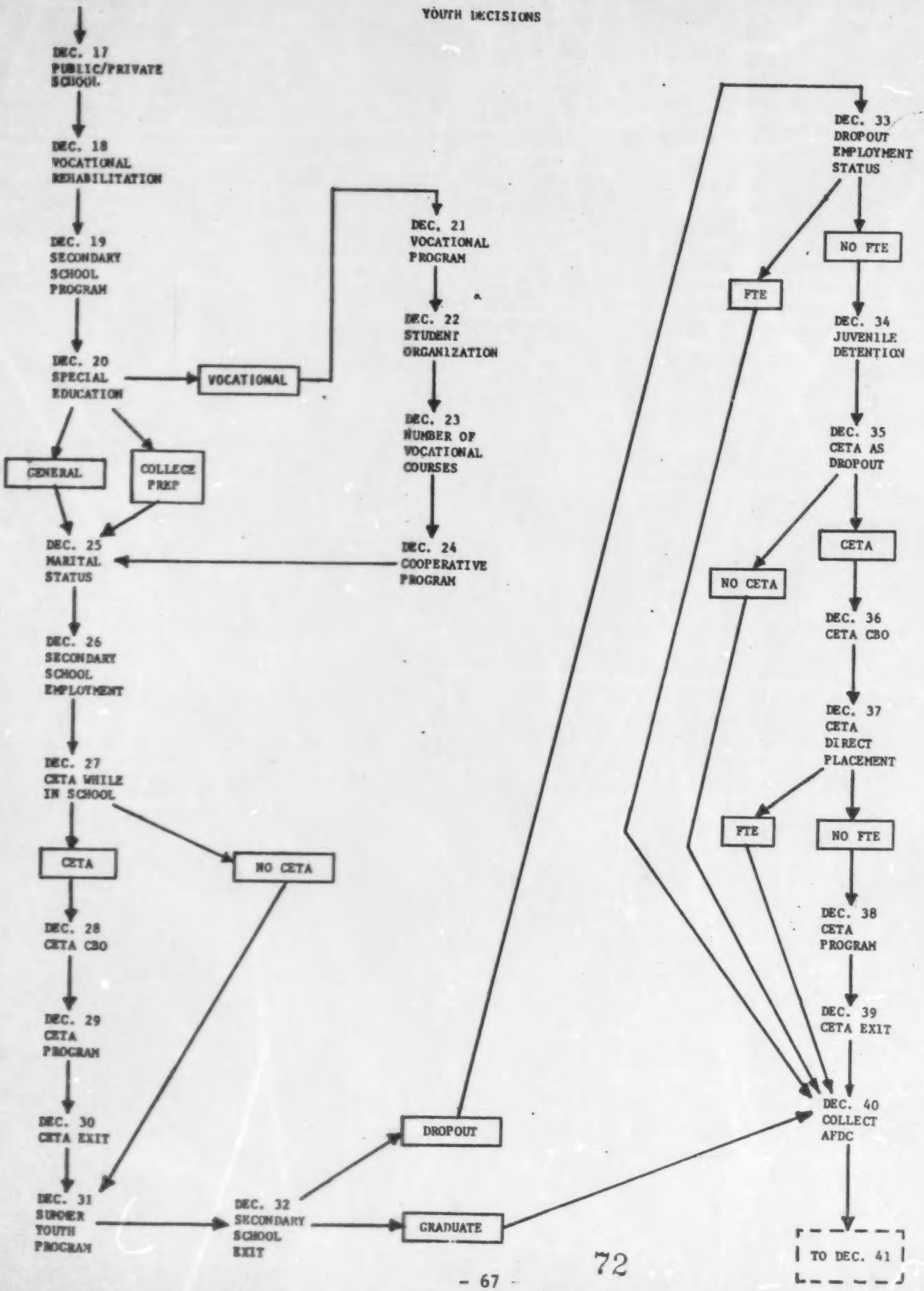
WISCONSIN TWS

MAJOR SECTIONS

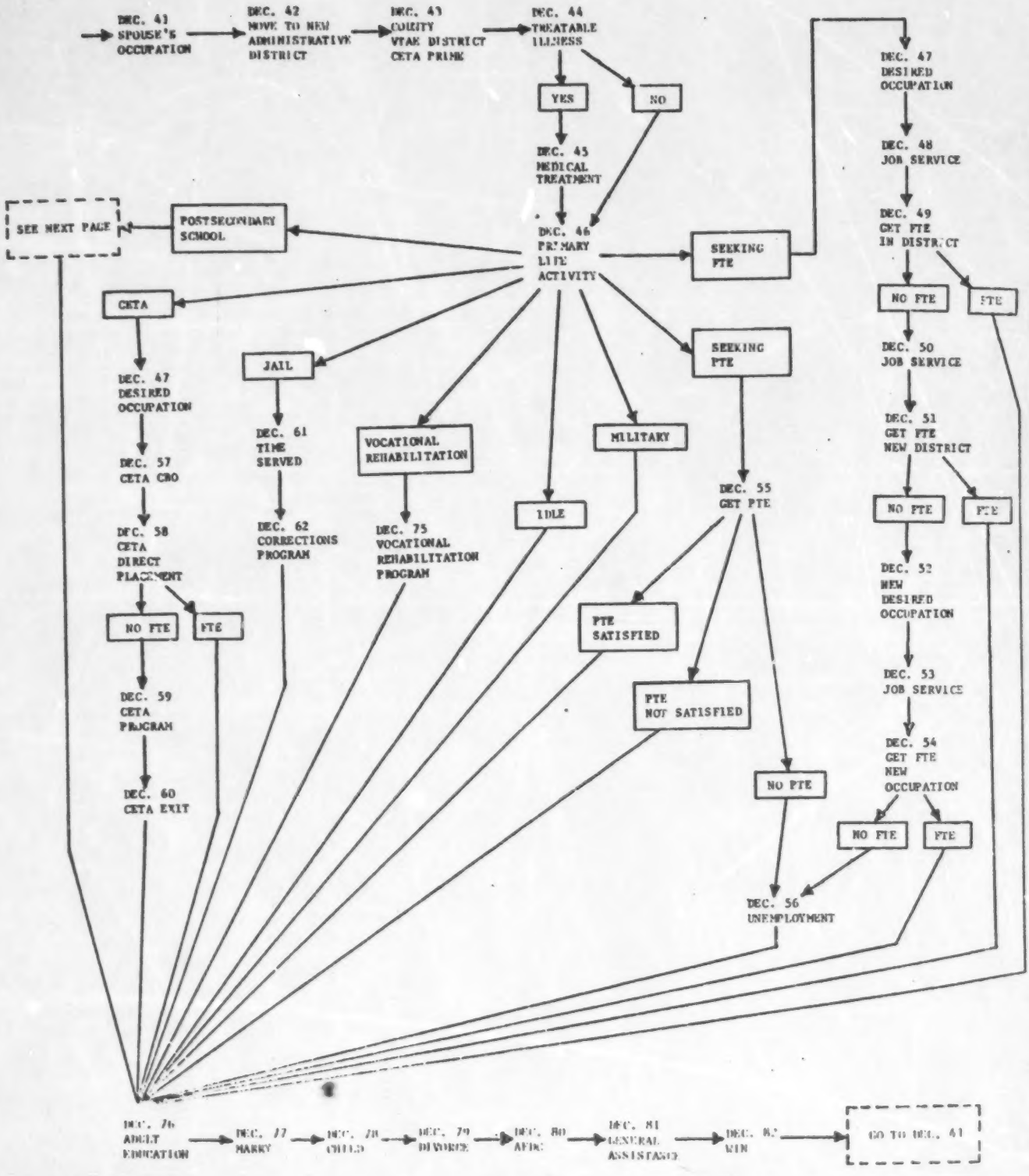


CREATION DECISIONS

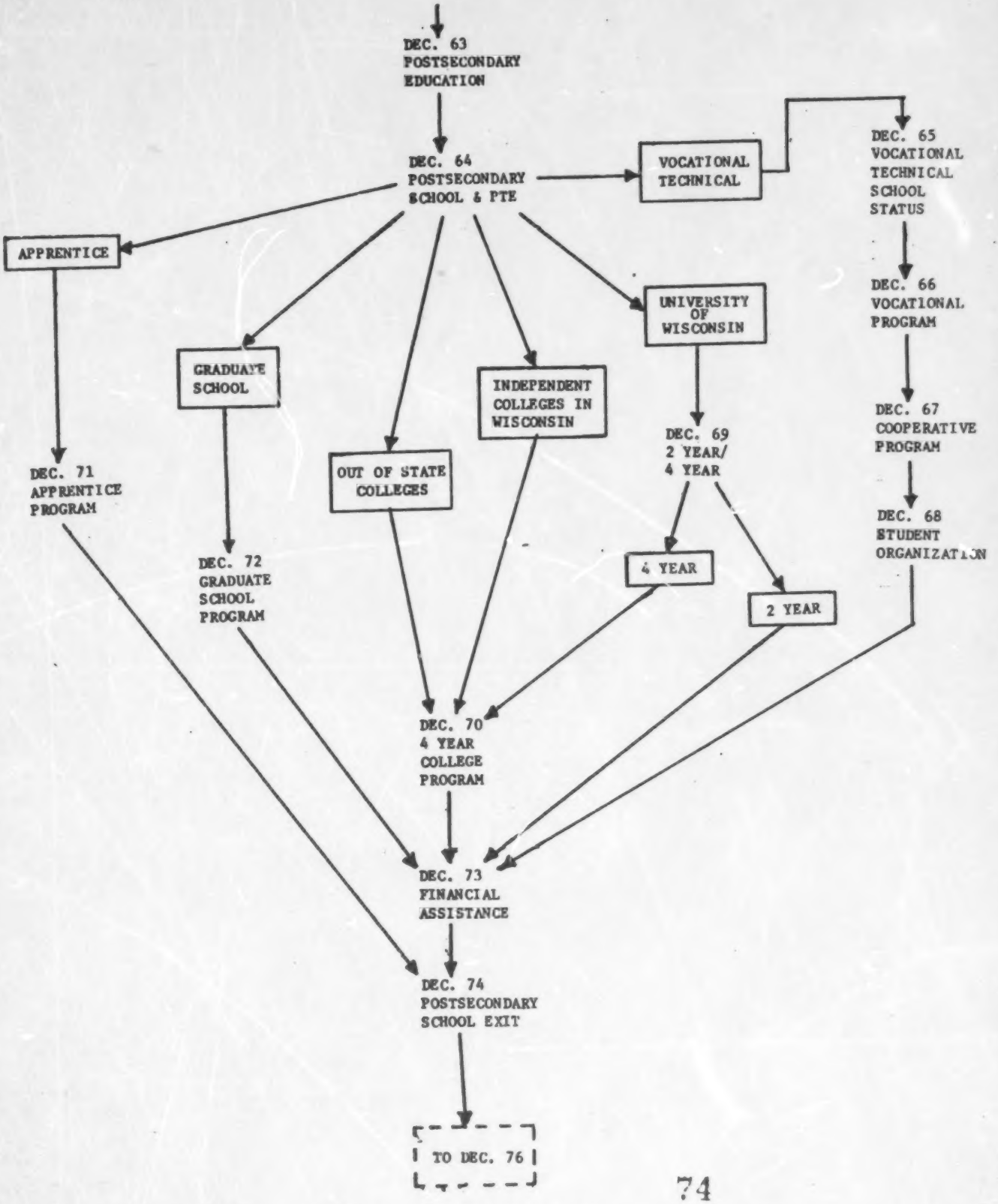



DEC. 17
PUBLIC/PRIVATE SCHOOL
DEC. 18
VOCATIONAL REHABILITATION
DEC. 19
SECONDARY SCHOOL PROGRAM
DEC. 20
SPECIAL EDUCATION
VOCATIONAL
GENERAL
COLLEGE PREP
DEC. 21
VOCATIONAL PROGRAM
DEC. 22
STUDENT ORGANIZATION
DEC. 23
NUMBER OF VOCATIONAL COURSES
DEC. 24
COOPERATIVE PROGRAM
DEC. 25
MARITAL STATUS
DEC. 26
SECONDARY SCHOOL EMPLOYMENT
DEC. 27
CETA WHILE IN SCHOOL
CETA
NO CETA
DEC. 28
CETA CBO
DEC. 29
CETA PROGRAM
DEC. 30
CETA EXIT
DEC. 31
SUMMER YOUTH PROGRAM
DEC. 32
SECONDARY SCHOOL EXIT
DROPOUT
GRADUATE
DEC. 33
DROPOUT EMPLOYMENT STATUS
FTE
NO FTE
DEC. 34
JUVENILE DETENTION
DEC. 35
CETA AS DROPOUT
CETA
NO CETA
DEC. 36
CETA CBO
DEC. 37
CETA DIRECT PLACEMENT
FTE
NO FTE
DEC. 38
CETA PROGRAM
DEC. 39
CETA EXIT
DEC. 40
COLLECT AFDC
TO DEC. 41

ANNUAL ADULT DECISIONS



POSTSECONDARY SCHOOL DECISIONS



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